

HABITS AND BIOLOGY OF THE BEECH MEALYBUG,
PELIOCOCCUS SERRATUS (FERRIS)
(COCCOIDEA, PSEUDOCOCCIDAE)

LOUISE M. RUSSELL

Systematic Entomology Laboratory, BBII, Agricultural Research Service, USDA, BARC-West, Beltsville, Maryland 20705.

Abstract.—The beech mealybug, *Peliococcus serratus* (Ferris), lives on *Fagus grandifolia* J. F. Ehrh. in eastern North America. In Maryland the species has two generations a year. Adult females settle on the bark of tree trunks and form a covering ovisac in which eggs are deposited from June until August and October through November. Eggs laid in summer hatch in about 7-14 days while those deposited in the fall overwinter. Mealybugs and eggs are destroyed by adverse weather conditions, parasitoids, and predators. Annotated citations are given to literature on the species.

This article portrays, for the first time, the biology and habits of the beech mealybug, *Peliococcus serratus* (Ferris), in North America. It supplements the meager data available on a scale insect that lives on American beech, *Fagus grandifolia* J. F. Ehrh. (= *F. americana* Sweet), a valued forest and shade tree. The mealybug merits study because of general interest in the ecology of indigenous insects and because it adds to the little that is known of the life cycles of most mealybugs native to the Nearctic fauna. The beech mealybug occurs sparingly and would achieve pest status only under greatly changed conditions. Although *P. serratus* apparently is restricted to *Fagus* (Fagaceae) in North America, it was reported from *Corylus avellana* L. (Betulaceae) in Italy by Tranfaglia (1976).

Literature on *P. serratus* is limited to the following annotated citations:

Phenacoccus serratus Ferris, 1925: 231-232 (description, 3 collections); Trimble, 1928: 43 (recorded as rare); Friend, 1932: 596 (ovisacs described); Britton, 1933: 375 (recorded); Rau, 1942: 124 (location

of immatures, attended by ants, reared parasites *Homalotylus* sp. and *Leptomastidea* sp.); Herting and Simmonds, 1972: 118 (rerecorded parasites listed by Rau). *Peliococcus serratus* (Ferris), Ferris, 1950: 118 (redescription, 2 additional collections); Baker, 1972: 99 (erroneously recorded from birch); Tranfaglia, 1976: 134-136 (redescribed from *Corylus avellana* in Italy, biology, habits, attended by ants, *Crematogaster* sp.), 1981: 9 (referred to 1976 report); Drooz, 1985: 94 (distribution in U.S.).

METHODS

My study of *Peliococcus serratus* extended from October 1977 through September 1986 in a forested area in Silver Spring, Montgomery County, Maryland. About 50 trees were scrutinized to a height of 4.5 m with the unaided eye and to 9.1 m with binoculars. Tree trunks harboring mealybugs or ovisacs measured 15.2-20.3 cm in diameter at base. Insects or ovisacs were located 0.3-2.4 m from the ground on tree trunks. Mealybugs without ovisacs were ob-



Fig. 1. Ovisacs of *Peliococcus serratus* in knot hole on bark of tree trunk.

served on leaves and twigs 2.4 m above ground although they unquestionably were present at a much greater height. Trees were examined monthly all year and, if infested, usually were scrutinized weekly or daily April through November. Mealybugs or ovisacs were found on only four trees, one of which was located 1 km from the others and on which ovisacs were found only in 1986. The other trees were in close proximity, one being 3.6 m from two that were 1.5 m apart. Mealybugs or ovisacs were present on one tree each of the 9 years, on one in 1981, 1983, 1985, 1986, and on the other only in 1985. Tops of the two closest trees intertwined. Specimens were not seen from October 1983 to November 1984, the longest period in which mealybugs or ovisacs were not observed. After examination of the trees, immatures, adult females, and ovisacs were brought into the laboratory for further study.

RESULTS

Ovisacs are formed gradually in 3–6 days and when complete are subrectangular, 5–8 mm long, and pure white (Fig. 1). Those formed in the summer tend to be smaller than those made in the fall. The outside is rather feltlike, the inside is fluffy and filamentous, and they are thicker dorsally than ventrally.

When females are ready to oviposit, they crawl down the tree trunk from the tree canopy and usually settle in a knot hole, scar, crevice or other rough, protecting place. Occasionally, however, they settle on smooth bark or move to a second location even after the ovisac is formed. At this time the females are deep pink or dark purple and have a thin, white, waxy substance arranged in transverse rows across the body. A large female in this condition on 6 October 1985 had a little white fuzzy material on the body,

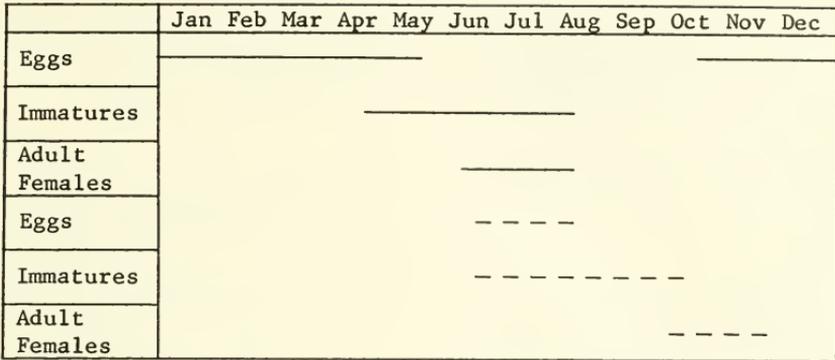


Fig. 2. Seasonal history of *Peliococcus serratus* in Maryland. Solid line denotes first generation, broken line second generation.

more posteriorly than anteriorly, on 7 October. The buildup continued through 11 October and on 12 October the ovisac was complete. This female started laying eggs 3–4 days after the ovisac was completed. On 30 October the ovisac was removed and brought to the laboratory. The shrivelled, but soft body of the female was located at one end and 225 eggs filled the remainder of the ovisac. The female died, and a few eggs hatched within 3 days but most of them collapsed. The development of this female, ovisac, and eggs was analogous to that of other specimens.

Eggs deposited in October and November overwinter and hatch from late April to early May of the following year (Fig. 2). Crawlers travel up tree trunks and onto the branches where they and later stages occur on the lower surface of leaves and on bark in twig axils. In this location adults develop in approximately 4 weeks. From late June into July and occasionally into August, females come down the tree trunks, form ovisacs, and lay eggs which hatch in 7–14 days. Only 55–60 eggs were found in summer ovisacs and only 60 eggs were counted in 1 ovisac formed in October. However, 200–225 eggs were found in most ovisacs formed in the fall. Initially the eggs are bright yellow and some remain yellow, but the majority

turn pink, and some, presumably dead, become black.

Descending and ovisac-forming females were not found in September, but second stage specimens and adult females were present on leaves and twigs at this time. Owing to the location of the insects in the tree canopy, I was unable to determine the length of the first and second stages. Adult males were not found, but 6 male cocoons, possibly of *P. serratus* because no other cocoon-forming species was present, were collected in July and September.

Rau (1942) noted that *P. serratus* was occasionally attended and shielded by ants, and Tranfaglia (1976) wrote that the species is habitually cultured by a formicid for the production of honeydew. I have not observed these activities although I have seen ants on the same tree trunks as the mealybugs.

P. serratus exists under hazardous conditions. Insects and ovisacs are dislodged by strong winds and heavy rains almost instantly, and they are attacked by hymenopterous parasites (Rau, 1942; Herting and Simmonds, 1972). I have observed adult hymenopterous parasites, coccinellid and chrysopid larvae on tree trunks near mealybugs, syrphid larvae near and inside mealybugs, and both hibernating and predaceous

mites in ovisacs. Ovisacs also are sometimes covered with fungus. Ovisacs, females and eggs may be totally destroyed by one or more of these agents within 8 hours.

The distribution of *P. serratus* as indicated by literature citations and/or the presence of specimens in the National Collection of Coccoidea at Beltsville, Maryland is as follows:

Canada.—Ontario (Ferris, 1925, 1950).

United States.—Connecticut: (Friend, 1932), (Britton, 1933), USNM; District of Columbia: USNM; Maryland: (Ferris, 1950), USNM; Massachusetts: USNM; New Hampshire: USNM; New Jersey: USNM; New York (Ferris, 1925, 1950), USNM; Ohio: (Ferris, 1925, 1950), USNM; Pennsylvania: (Trimble, 1928), USNM; Tennessee: USNM; Virginia: (Drooz, 1985), USNM.

Europe.—Italy: Campania (Tranfaglia, 1976).

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LITERATURE CITED

- Baker, W. L. 1972. Eastern Forest Insects. U.S. Dept. Agr. For. Serv. Misc. Publ. 1175. 642 pp.
- Britton, W. E. 1933. Entomological features of 1932. Conn. Agr. Exp. Sta. Bull. 349: 369–381.
- Drooz, A. T. 1985. Insects of Eastern Forests. U.S. Dept. Agr. For. Serv. Misc. Publ. 1426. 608 pp.
- Ferris, G. F. 1925. Notes on Coccidae XI (Hemiptera). Can. Entomol. 57(9): 228–234.
- . 1950. Atlas of the Scale Insects of North America. (ser. 5) V: vii + 278 pp. Stanford University Press, Stanford, California.
- Friend, R. B. 1932. A new scale insect on beech. Conn. Agr. Exp. Sta. Bull. 338: 596.
- Herting, B. and F. F. Simmonds. 1972. A Catalogue of Parasites and Predators of Terrestrial Arthropods. Commonwealth Inst. Biol. Control. 210 pp.
- Rau, G. J. 1942. The Canadian apple mealybug, *Phenacoccus aceris* Signoret, and its allies in northeastern America. Can. Entomol. 74(7): 118–125.
- Tranfaglia, A. 1976. Studi sugli Homoptera Coccoidea IV. Su alcune cocciniglie nuove o poco conosciute per l'Italia (Coccidae, Eriococcidae, Pseudococcidae). Boll. Lab. Entomol. Agr. "Filippo Silvestri" Portici 33: 128–143.
- . 1981. Studi sugli Homoptera Coccoidea V. Notizie morphosistematiche su alcune specie di cocciniglie con descrizione di tre nuove specie di Pseudococcidi. Boll. Lab. Entomol. Agr. "Filippo Silvestri" Portici 38: 3–28.
- Trimble, F. M. 1928. Scale insects of Pennsylvania (Homop.: Coccidae). Entomol. News 39(2): 42–47.